

**Course Information**

Date Submitted: 10/8/2015

Current Prefix and Number: CHE - Chemistry , CHE 226 ANALYTICAL CHEMISTRY

Other Course:

Proposed Prefix and Number: CHE 226

What type of change is being proposed?

Major Change

Should this course be a UK Core Course? No

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OFFICE OF THE  
SENATE COUNCIL**1. General Information**

a. Submitted by the College of: ARTS &amp; SCIENCES

b. Department/Division: Chemistry

c. Is there a change in 'ownership' of the course? No

If YES, what college/department will offer the course instead: Select...

e. Contact Person

Name: Arthur Cammers

Email: a.cammers@uky.edu

Phone: 8593238977

Responsible Faculty ID (if different from Contact)

Name:

Email:

Phone:

f. Requested Effective Date

Semester Following Approval: Yes OR Effective Semester:

**2. Designation and Description of Proposed Course**

a. Current Distance Learning (DL) Status: N/A

b. Full Title: ANALYTICAL CHEMISTRY

Proposed Title: ANALYTICAL CHEMISTRY

c. Current Transcript Title: ANALYTICAL CHEMISTRY

Proposed Transcript Title: ANALYTICAL CHEMISTRY

d. Current Cross-listing: none

Proposed – ADD Cross-listing :

Proposed – REMOVE Cross-listing:

e. Current Meeting Patterns

LECTURE: 2

LABORATORY: 3-6

Proposed Meeting Patterns

LECTURE: 2

LABORATORY: 3

f. Current Grading System: ABC Letter Grade Scale

Proposed Grading System: *Letter (A, B, C, etc.)*

g. Current number of credit hours: 3 - 5 (variable)

Proposed number of credit hours: 3

h. Currently, is this course repeatable for additional credit? No

Proposed to be repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester? No

2i. Current Course Description for Bulletin: An introduction to the theory and practice of quantitative analysis. Lecture, two hours; laboratory, three to six hours.

Proposed Course Description for Bulletin: An introduction to the theory and practice of quantitative chemical analysis. Lecture, 2 hours; laboratory, 3 hours.

2j. Current Prerequisites, if any: Prereq: CHE 107 and either CHE 113 or CHE 115.

Proposed Prerequisites, if any: Prereq: CHE 107 and CHE 113.

2k. Current Supplementary Teaching Component:

Proposed Supplementary Teaching Component:

3. Currently, is this course taught off campus? No

Proposed to be taught off campus? No

If YES, enter the off campus address:

4. Are significant changes in content/student learning outcomes of the course being proposed? No

If YES, explain and offer brief rationale:

5a. Are there other depts. and/or pgms that could be affected by the proposed change? No

If YES, identify the depts. and/or pgms: The Chemistry faculty voted that we remove the variable credit for CHE 226 in a plenary meeting in Nov 2014. CHE 226 has not been taken by any student for variable credit since before 2000. The variable credit on the books generates questions to the DUS from many people and unnecessarily complicates UK Chemistry offerings. Mention of CHE 115 in the prereqs is not necessary. The approval to drop CHE 115 is complete. The reason this proposal is listed as a major change is due to a change in credits listed for CHE 226, otherwise the changes proposed to the course are minor.

5b. Will modifying this course result in a new requirement of ANY program? No

If YES, list the program(s) here:

6. Check box if changed to 400G or 500: No

## Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1. How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4. Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6. How do course requirements ensure that students make appropriate use of learning resources?

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)?

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10. Does the syllabus contain all the required components? NO

11.I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|ACSI222|Anna C Harmon|CHE 226 CHANGE College Review (MINOR CHANGE)|20150128

SIGNATURE|YATES|S W Yates|CHE 226 CHANGE Dept Review (MINOR CHANGE)|20150128

SIGNATURE|YATES|S W Yates|CHE 226 ZCOURSE\_CHANGE Approval Returned to Dept (MINOR CHANGE)|20150129

SIGNATURE|YATES|S W Yates|CHE 226 CHANGE Dept Review|20150129

SIGNATURE|YATES|S W Yates|CHE 226 CHANGE Dept Review|20150129

SIGNATURE|YATES|S W Yates|CHE 226 CHANGE Dept Review|20150129

SIGNATURE|ACSI222|Anna C Harmon|CHE 226 CHANGE College Review|20150303

SIGNATURE|JMETT2|Joanie Ett-Mims|CHE 226 CHANGE Undergrad Council Review|20151113

## Course Change Form

<https://myuk.uky.edu/sap/bc/soap/rfc?services=>

Open in full window to print or save

Generate R

## Attachments:

Browse...

Upload File

	ID	Attachment
Delete	4322	Spring 2015 226 Lab Syllabus-AC.pdf
Delete	5514	CHE 226 - Syllabus Lec 2015.pdf

First 1 Last

NOTE: Start form entry by choosing the Current Prefix and Number  
(\*denotes required fields)

Current Prefix and Number:		CHE - Chemistry CHE 226 ANALYTICAL CHEMISTRY	Proposed Prefix & Number: (example: PHY 401G) <input checked="" type="checkbox"/> Check if same as current	CHE 226
* What type of change is being proposed?		<input checked="" type="checkbox"/> Major Change <input type="checkbox"/> Major - Add Distance Learning <input type="checkbox"/> Minor - change in number within the same hundred series, except 799 is the same "hundred series" <input type="checkbox"/> Minor - editorial change in course title or description which does not change in content or emphasis <input type="checkbox"/> Minor - a change in prerequisite(s) which does not imply a change in course content or emphasis, or which is made necessary by the elimination or significant alteration of the prerequisite(s) <input type="checkbox"/> Minor - a cross listing of a course as described above		
Should this course be a UK Core Course? <input type="radio"/> Yes <input checked="" type="radio"/> No				
If YES, check the areas that apply:				
<input type="checkbox"/> Inquiry - Arts & Creativity <input type="checkbox"/> Composition & Communications - II <input type="checkbox"/> Inquiry - Humanities <input type="checkbox"/> Quantitative Foundations <input type="checkbox"/> Inquiry - Nat/Math/Phys Sci <input type="checkbox"/> Statistical Inferential Reasoning <input type="checkbox"/> Inquiry - Social Sciences <input type="checkbox"/> U.S. Citizenship, Community, Diversity <input type="checkbox"/> Composition & Communications - I <input type="checkbox"/> Global Dynamics				
1. General Information				
a. Submitted by the College of:		ARTS & SCIENCES		Submission Date: 10/8/2015
b. Department/Division:		Chemistry		
c.* Is there a change in "ownership" of the course?				
<input type="radio"/> Yes <input checked="" type="radio"/> No    If YES, what college/department will offer the course instead? <input type="text" value="Select..."/>				
e.* Contact Person Name:		Arthur Cammers		Email: a.cammers@uky.edu    Phone: 8593238977
* Responsible Faculty ID (if different from Contact)				Email:    Phone:
f.* Requested Effective Date:		<input checked="" type="checkbox"/> Semester Following Approval    OR <input type="checkbox"/> Specific Term: <sup>2</sup>		
2. Designation and Description of Proposed Course.				
a. Current Distance Learning(DL) Status:		<input checked="" type="radio"/> N/A <input type="radio"/> Already approved for DL* <input type="radio"/> Please Add <input type="radio"/> Please Drop		
*If already approved for DL, the Distance Learning Form must also be submitted <u>unless</u> the department affirms (by checking this box ) that the proposed change affect DL delivery.				
b. Full Title:		ANALYTICAL CHEMISTRY		Proposed Title: * ANALYTICAL CHEMISTRY
c. Current Transcript Title (if full title is more than 40 characters):		ANALYTICAL CHEMISTRY		
c. Proposed Transcript Title (if full title is more than 40 characters):		ANALYTICAL CHEMISTRY		
d. Current Cross-listing:		OR		

	<input checked="" type="checkbox"/> N/A	Currently <sup>2</sup> Cross-listed with (Prefix & Number):	none
Proposed – ADD <sup>3</sup> Cross-listing (Prefix & Number):			
Proposed – REMOVE <sup>3,4</sup> Cross-listing (Prefix & Number):			
<b>e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours<sup>5</sup> for each meeting pattern</b>			
<b>Current:</b>	Lecture 2	Laboratory <sup>5</sup> 3-6	Recitation
			Discussion
			Indep. Study
	Clinical	Colloquium	Practicum
			Research
			Residency
	Seminar	Studio	Other _____ Please explain: _____
<b>Proposed: *</b>	Lecture 2	Laboratory <sup>5</sup> 3	Recitation
			Discussion
			Indep. Study
	Clinical	Colloquium	Practicum
			Research
			Residency
	Seminar	Studio	Other _____ Please explain: _____
<b>f.</b>	<b>Current Grading System:</b>	ABC Letter Grade Scale	
	<b>Proposed Grading System:*</b>	<input checked="" type="radio"/> Letter (A, B, C, etc.) <input type="radio"/> Pass/Fail <input type="radio"/> Medicine Numeric Grade (Non-medical students will receive a letter grade) <input type="radio"/> Graduate School Grade Scale	
<b>g.</b>	<b>Current number of credit hours:</b>	3 - 5 (variable)	<b>Proposed number of credit hours:*</b> 3
<b>h.*</b>	<b>Currently, is this course repeatable for additional credit?</b>		<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>*</b>	<b>Proposed to be repeatable for additional credit?</b>		<input type="radio"/> Yes <input checked="" type="radio"/> No
	<b>If YES:</b>	<b>Maximum number of credit hours:</b>	
	<b>If YES:</b>	<b>Will this course allow multiple registrations during the same semester?</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>i.</b>	<b>Current Course Description for Bulletin:</b>		
	An introduction to the theory and practice of quantitative analysis. Lecture, two hours; laboratory, three to six hours.		
<b>*</b>	<b>Proposed Course Description for Bulletin:</b>		
	An introduction to the theory and practice of quantitative chemical analysis. Lecture, 2 hours; laboratory, 3 hours.		
<b>j.</b>	<b>Current Prerequisites, if any:</b>		
	Prereq: CHE 107 and either CHE 113 or CHE 115.		
<b>*</b>	<b>Proposed Prerequisites, if any:</b>		
	Prereq: CHE 107 and CHE 113.		
<b>*</b>			
<b>k.</b>	<b>Current Supplementary Teaching Component, if any:</b>		<input type="radio"/> Community-Based Experience

		<input type="radio"/> Service Learning <input type="radio"/> Both
	Proposed Supplementary Teaching Component:	<input type="radio"/> Community-Based Experience <input type="radio"/> Service Learning <input type="radio"/> Both <input type="radio"/> No Change
3.	Currently, is this course taught off campus?	<input type="radio"/> Yes <input checked="" type="radio"/> No
*	Proposed to be taught off campus?	<input type="radio"/> Yes <input checked="" type="radio"/> No
	If YES, enter the off campus address:	
4.*	Are significant changes in content/student learning outcomes of the course being proposed?	<input type="radio"/> Yes <input checked="" type="radio"/> No
	If YES, explain and offer brief rationale:	
5.	Course Relationship to Program(s).	
a.*	Are there other depts and/or pgms that could be affected by the proposed change?	<input type="radio"/> Yes <input checked="" type="radio"/> No
	If YES, identify the depts. and/or pgms:	
	<p>The Chemistry faculty voted that we remove the variable credit for CHE 226 in a plenary meeting in Nov 2014. CHE 226 has not been taken by any student for variable credit since before 2000. The variable credit on the books generates questions to the DUS from many people and unnecessarily complicates UK Chemistry offerings.</p> <p>Mention of CHE 115 in the prereqs is not necessary. The approval to drop CHE 115 is complete.</p> <p>The reason this proposal is listed as a major change is due to a change in credits listed for CHE 226, otherwise the changes proposed to the course are minor.</p>	
b.*	Will modifying this course result in a new requirement <sup>2</sup> for ANY program?	<input type="radio"/> Yes <input checked="" type="radio"/> No
	If YES <sup>2</sup> , list the program(s) here:	
6.	Information to be Placed on Syllabus.	
a.	<input type="checkbox"/> Check box if changed to 400G or 500.	If changed to 400G- or 500-level course you must send in a syllabus and you must include the differentiation between under and graduate students by: (i) requiring additional assignments by the graduate students; and/or (ii) establishing different grad criteria in the course for graduate students. (See SR 3.1.4.)

<sup>1</sup>See comment description regarding minor course change. *Minor changes are sent directly from dean's office to Senate Council Chair.* If Chair deems the change as "not minor," the form will be appropriate academic Council for normal processing and contact person is informed.

<sup>2</sup>Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

<sup>3</sup>Signature of the chair of the cross-listing department is required on the Signature Routing Log.

<sup>4</sup>Removing a cross-listing does not drop the other course – it merely unlinks the two courses.

<sup>5</sup>Generally, undergrad courses are developed such that one semester hr of credit represents 1 hr of classroom meeting per wk for a semester, exclusive of any lab meeting. Lab meeting generally two hrs per wk for a semester for 1 credit hour. (See SR 5.2.1.)

<sup>6</sup>You must also submit the Distance Learning Form in order for the course to be considered for DL delivery.

<sup>7</sup>In order to change a program, a program change form must also be submitted.

## Analytical Chemistry - CHE 226 Laboratory Syllabus – Spring Semester 2015

**Pre-Lab:** Section 1, Monday 1-1:50 pm CP-208.  
Section 2, Wednesday 1-1:50 pm CP-208.  
Section 3, Friday 1-1:50 pm CP-208

**Laboratory Hours:** Section 1, Monday 1:50-3:50 pm CP-236.  
Section 2, Wednesday 1:50-3:50 pm CP-236.  
Section 3, Friday 1:50-3:50 pm CP-236.

**Instructor:** Dr. Doo Young Kim

**Office:** CP 101

**Office hours:** Tuesday & Thursday 10:30am -11:30 am or by appointment by *email*.

**E-mail:** dooyoung.kim @uky.edu (All emails sent to the instructor must have CHE 226 in the subject header line)

### Teaching and Laboratory Assistants Contact Information:

	Brent Casper	Evie Zhou	Yuchen Zhang	Tim Little
Office	CP-236	CP-150B	CP-2	CP-38
Phone	859-218-6551	859-323-0309	859-257-6150	859-257-0799
Email	brent.casper@uky.edu	ruixin.zhou@uky.edu	yzh323@uky.edu	tjli224@uky.edu
Office hours	Mon 12 -1pm Wed 12- 1pm	Tues 2-3pm Thur 2-3pm	Fri 9:30-10:30am Tues 1-2 pm	Mon 11am-12pm Wed 11am-12pm

### Laboratory Experiments:

Expt.	3 Credit Student	Grader & Lab Coordinator	Assistant Lab Coordinator
1	Laboratory Techniques	Brent Casper	All TAs
2	Gravimetric Chloride Analysis	Evie Zhou	Brent Casper
3	Complexometric Titration of Zinc with EDTA	Yuchen Zhang	Brent Casper
4	Determination of Calcium and Cadmium by Atomic Absorption Spectroscopy	Evie Zhou	Tim Little
5	Optical Spectroscopy of Porphyrins	Tim Little	Evie Zhou
6	Applications of ATR Infrared Spectroscopy	Brent Casper	Yuchen Zhang
7	Quality Analysis by Electrogravimetry	Yuchen Zhang	Tim Little

### Tentative Laboratory Schedule

The schedule below is only tentative because experiments may take greater or lesser amounts of time. The *instrumental* experiments will be scheduled for you on a specific date later in the semester, and will take



only one lab period to complete. You will largely conduct the experiments "on your own" for Experiments 1-3. You must plan ahead and prepare well ahead of time to get them completed in a timely manner. For each experiment, students will attend pre-lab (in CP-208) prior to the lab (in CP-236). Just keep coming to CP- 208 at 1 pm unless informed otherwise. It is mandatory to conduct the experiments on the date your session correspond to. You may work on the afternoon that you are not normally scheduled only with permission of the TA if bench space is available.

Monday	Wednesday	Friday	Pre-Lab Topics CP-208	In Lab CP236
1/26	1/28	1/30	Lab Syllabus Check in procedure Lab Techniques Tour of the Lab	Check in Clean out locker thoroughly Begin Lab Techniques <i>Submit Cl<sup>-</sup> unknown container</i>
2/2 2/9 2/16	2/4 2/11 2/18	2/6 2/13 2/20	Gravimetric Chloride Analysis	Lab Techniques Crush/dry chloride unknown Clean and dry crucibles Weigh out/precipitate/dry chloride samples Finish Gravimetric Cl <sup>-</sup> Finish Lab Techniques <i>Submit Zn unknown container</i> Prepare EDTA for complexometric titration
2/23 3/2	2/25 3/4	2/27 3/6	Complexometric Titration of Zinc with EDTA	Prepare Ca standard solution Standardize EDTA solution Titrate Zn Unknown Finish Lab Techniques <i>Submit unknown sample container</i>
3/9	3/11	3/13	Atomic Absorption Spectroscopy: Minerals Analysis of Mushrooms	Prepare Ca and Cd stock solution Prepare standard solutions Finish Lab Techniques
3/16	3/18	3/20	<b>Spring Break</b>	<b>Spring Break</b>
3/23	3/25	3/27	Optical Spectroscopy of Porphyrins	Extract Porphyrins UV-Visible Spectroscopy Fluorescence Spectroscopy
3/30	4/1	4/3	Applications of ATR-FTIR	Prepare reference and unknown samples Clean the diamond crystal Finish FTIR Analysis
4/6	4/8	4/10	Quality Analysis by Electrogravimetry	Prepare Copper Electrode and Sample Finish technique and weigh the foil
4/13	4/15	4/17	Finish experiments	Complete all experiments
4/20	4/22	4/24	Finish experiments	<b>Check out</b>

### Other Important Information

#### See on Blackboard:

- Guide for Complete Lab Reports, including samples
- Safety in the Analytical Laboratory
- Laboratory Fees
- List of Containers for Unknown Samples

- Using Material Safety Data Sheets (MSDSs)
- Procedures for Individual Laboratory Experiments

### Some Important Dates for the CHE 226 Laboratory

- **January 13 (Tuesday):** Last day to officially withdraw from the University or reduce course load and receive a full refund.
- **January 19 (Monday):** Martin Luther King, Jr. Day - Academic Holiday.
- **January 21 (Wednesday):** Last day to officially withdraw from the University or reduce course load and receive an 80 percent refund.
- **January 26, 28, and 30: First Laboratory (Submit CI container).**
- **February 4 (Wednesday):** Last day to drop a course without it appearing on the student's transcript.
- **February 11 (Wednesday):** Last day to officially withdraw from the University or reduce course load and receive a 50 percent refund.
- **March 9 (Monday):** Midterm of 2014 Fall Semester.
- **March 16-21 : Spring Break**
- **April 10 (Friday):** Last day to withdraw from the University or reduce course load. Students can withdraw or reduce course load after this date only for urgent non-academic reasons.
- **April 24 (Friday):** Last day the CHE 226 Laboratory will be open. **All students must formally check out of the laboratory on or before this date. ALL CHE 226 LABORATORY REPORTS MUST BE SUBMITTED TO YOUR Teaching Assistant BY 5:00 PM.**
- **April 30 (Thursday):** Last lecture.
- **May 4-8:** Final Examinations.

### Unknowns

The Teaching Assistants will dispense unknowns and have them ready for you **one lab period following receipt of the appropriate container**. That is, unknowns will *not* be dispensed on the same day as requested. The Teaching Assistants simply do not have the time to prepare unknowns during the busy laboratory periods. Therefore, it is very important that you plan ahead. For example, Experiment #3 requires that you prepare and filter an EDTA stock solution at least one day before you use it; this is critical. Most of the other experiments require you to turn in a labeled volumetric flask to the Teaching Assistants. The unknown is dispensed into the flask and you dilute it to volume with distilled or deionized water and mix thoroughly before taking an aliquot for analysis.

### Laboratory Notebook

Each student is required to have his or her own Laboratory Notebook with carbon copies and *with numbered pages that tear out cleanly*. It does not have to be brand new; you may start the semester using a notebook from a previous course that has some room left in it. Leave at least the first three pages of your notebook empty in order to put in a Table of Contents. The notebook pages must be used sequentially in *historical time order*. In the laboratory, **all** information, data, calculations, notes, etc. should be recorded directly into this notebook and **not** on scrap paper.

Writing should be clear and concise and in ink. Use a ballpoint pen so that the writing comes through on the yellow carbon copy. Errors should be crossed out with a single line and the correction written next to it. Your notebook must reflect the absolute truth of your laboratory experience. Each page of your notebook must be dated.

**Before you leave the laboratory each time you have done lab work, one of the TAs must review your work and initial and date your notebook just below where your entries end.**

Before entering the laboratory, the student should become thoroughly familiar with the experiment and prepare the notebook to make record keeping and report writing more convenient. Title, procedure, theory, and tables for data should be prepared prior to the laboratory period. Lab Reports should be typed on the computer and printed before being handed in. We strongly encourage students to take advantage of software to create figures, graphs or chemical drawings to create more professional looking lab report but some hand drawing of figures will be tolerated.

**Formal lab reports are required for all experiments except the Laboratory Techniques experiment (Experiment #1).** Lab reports should be written according to the handout *Guide for Complete Lab Reports*. Examples of typed lab reports are available on Blackboard.

### **Grading Laboratory Performance**

Each of the other labs will be worth 100 points. The points are distributed as follows:

- **Pre-Lab Write-Up (10 Points)**
- **Subjective Performance Evaluation (10 Points)**
- **Accuracy/Precision (45 points)**
- **Laboratory Report (35 Points)** - Theory (10 points), results (10 points), discussion (10 points), and writing (5 points) -

Therefore, the 7 experiments for those taking the class for 3 credits is 700 maximum possible points. The total points you accrue during the semester will be converted to a percentage score, % Lab Score = Points earned  $\times$  100% divided by 700. This % score will then be used for that fraction of the final course grade.

Penalty points can be assessed on lab reports. Lab reports are due *one week* after each experiment is completed. Reports will be penalized **10 points** for every week or fraction thereof that the report is late.

### **Pre-Lab Write-Up (10 Points)**

**Prior** to doing a laboratory experiment, you must understand the lab thoroughly and be prepared to work efficiently. Read through the handout for that laboratory thoroughly and plan your work ahead of time. Except for Experiment #1, you must have essentially written up the "Theory" and "Procedure" sections *in your Laboratory Notebook* **prior** to beginning the experiment. This should be a logical and structured set of notes that summarize the steps in the experiment. Ideally, this should enable you to do the experiment without referring to the handout, except perhaps for the detailed step-by-step instructions for operating an instrument. The Pre-Lab needs to be summarized in your own words; do not just copy the procedures as written in the handout.

If you wish, you can always rewrite the Procedure and Theory sections more elegantly in the Laboratory Report itself.

**You must show the Pre-Lab Write-Up to one of the Teaching Assistants and have it reviewed, initialed, and dated, before you may begin any experiment. If your Pre-Lab Write-Up is**

seriously deficient, you may well be asked to add to or re-do it before you are permitted to begin an experiment.

You *must* also write down the work you have done each day in your Lab Notebook. This writing should be reviewed, initialed, and dated by one of the Teaching Assistants *before* you leave the laboratory.

### Performance Evaluation (10 points)

The Instructor and the Teaching Assistants will be circulating through the laboratory to answer questions, assist you, and also to observe your overall laboratory technique and performance while doing an experiment. We will try to provide some indications as to the reason(s) for loss of points.

Examples of the things that will lead to loss of points include, but are not limited to –

- ✓ Arriving late for the laboratory session, especially if this persists or involves a scheduled instrumental experiment.
- ✓ Poor safety practices, especially not having your safety glasses on at all times while in the lab.
- ✓ Dirty or disorganized work areas.
- ✓ Using dirty glassware – e.g., reagent spots on the inside of burettes or pipettes
- ✓ Misuse or abuse of the instruments, especially the balances.
- ✓ Indications that you have prepared poorly and do not understand the lab sufficiently. This does not mean “Don’t ask questions.” If you have any questions or need confirmation of some point, *ask*. What is meant here is that “deer in the headlights” look indicating you’re clueless, or that you are constantly reading the laboratory handout. Major steps of parts of the experiment should have been outlined in your Prelab.
- ✓ Not cleaning up your lab bench area and any common work areas that you used before you leave for the day.
- ✓ Not turning off (and covering) your balance at the end of the lab.
- ✓ Insubordination
- ✓ In addition to penalty points for not cleaning up after yourself before you leave the lab, egregious sloppiness or major abuse of the instrumentation can result in your being assigned to do general laboratory cleaning tasks at the end of one of your lab periods.

### Accuracy (45 points)

Forty five points of the lab report depends on the *accuracy* with which you analyze the unknowns. The value you report for your unknown will be within a certain **range around the true or known value**. Your Accuracy grade will be higher the closer that the value you report for your unknown comes to the true value. Accuracy is graded in 5-point increments: 45, 40, 35, etc. Each experiment has its own *tolerance* or *window* within which your result must fall for a particular grade. For example, if the true value for your unknown is 1000 (in whatever units), and the tolerance for that experiment is  $\pm 3 \text{ ‰}$  (parts-per-thousand) or  $\pm 0.3\%$  *relative error*, your reported result must fall in the range  $1000 \pm 3$ , (from 997 to 1003) to earn the full grade of 45. If your result lies outside this range, but within the next set of 3 ‰ windows,  $1000 \pm 6$ , you earn a grade of 40, and so forth. If the tolerance for an experiment is  $\pm 2\%$  relative error, your result your reported result must fall between  $1000 \pm 20$ , (from 980 to 1020) to earn the full grade of 45 points. Outside this window, but inside  $1000 \pm 40$ , (from 960 to 1040) for 40 points, etc. If your reported result is wrong because of some

calculation error, even something as simple as a factor of 2 or a power of 10, your result is wrong. A wise precaution is to check your calculated final value with the document "Ranges of Values for Unknowns" which you can find on blackboard. The Teaching Assistants will not search through your report for calculation errors and correct them, so be very sure about your calculations before you turn in your report. Just about the only thing an analytical chemist has to show for all his/her laboratory work and care is a report – some words and numbers on a sheet of paper. A result is just as inaccurate if it suffers from an arithmetic error as from poor technique. If you have taken data carefully, however, a calculation error can be discovered.

If you discover that you have made a calculation error in a report you have turned in, you may re-submit the report with the new calculations and results attached for re-grading. There will be a 5-point penalty for this. So, if you get a report back with a very low accuracy grade, say 0 points, it would be a good idea to recheck all your calculations carefully.

### **Laboratory Report (35 Points)**

The final 35 points of the total lab report grade depends on how well and completely your report is written. There will be sample lab reports on Blackboard to help guide you.

- ✓ All text must be computer written and formatted in a professional looking manner (see examples).
- ✓ We strongly encourage you to use software to incorporate graphs, figures, tables and drawings into your lab reports.
- ✓ Some hand drawn figures will be tolerated for complicated drawings.

While past labs were allowed to have hand written reports, this change has been made to get you (as students) better prepared to deal with the real world where you will be expected to create professional reports and papers outlining your scientific results. As with most computer work, we strongly encourage saving back-ups of your files and note that you may be asked to provide us a copy of the files and you must provide them within 48 hours.

The distribution of possible points for each section of the Laboratory Report is shown below:

- Theory – 10 points
- Results – 10 points
- Discussion – 10 points
- Writing – 5 points
- Total – 35 points**

### **Penalty Points**

- ✓ ***Inadequate Reports.*** A 10-point penalty will be assessed for reports considered grossly insufficient or inadequate – for example, one of the required Sections is simply missing. The report will simply be returned to you ungraded. The report should be revised, deficiencies and errors corrected, and the report returned within one week or an additional penalty will be applied. A 1-point penalty will be assessed for each day the report is late thereafter, or until the report is considered adequate in exposition.
- ✓ ***Late Reports.*** Laboratory Reports are due one week after the lab has been completed. Some students have a tendency to allow reports to pile up until the last week or two of the semester. This is almost invariably disastrous and should be avoided at all costs because this does not give you a chance to repeat an experiment if poor results are obtained. Reports prepared hurriedly are extremely prone to simple calculation errors which negate even the most painstaking lab work. Lab reports that are late

will have 10 points deducted for each week that the report is late.

- ✓ **Repeating an Experiment.** If you wish to redo an experiment on which you received an Accuracy grade lower than you think you can get by repeating the experiment, you may ask the Teaching Assistant for a new unknown and reschedule a time to do the experiment if necessary. There is a 10-point penalty in the Accuracy grade for getting a second unknown when the new report is graded, 20 points for the third unknown on a particular experiment, etc. **You must allow your TA at least one full lab period to prepare a new sample.**

### Laboratory Report Format

Lab reports should have the following sections:

#### I. Procedure - Correct reference to the handout (experiment number and title)

1. Purpose/Hypothesis
2. A detailed list of the experimental procedure.

#### II. Theory/Background - The chemical reactions that were performed.

1. The reagents and their roles in making the various reactions occur.
2. Chemical structures of important reagents.
3. Briefly describe any important instrumentation and how the method works.
4. Important definitions

#### III. Data - All *raw data* tabulated, that is the actual data taken down and written in the lab notebook while doing the experiment. Tables or places for raw data should be set up before you come to lab. **Tables must have descriptive titles and column headings**, not just "Data for Experiment 2". Units must **always** be clearly indicated. If more than one, number each table sequentially.

1. Any calibration plots (figures). Figures must have a descriptive caption and units on the axes. If more than one, number each figure sequentially.

#### IV. Calculations - *ONE* sample calculation to show how the results and error (standard deviations) were obtained. It is not necessary (nor desirable) to show a calculation for each formula and sample.

#### V. Results and Error - Tabulated results from each trial and the mean (average value).

1. Analysis - Precision of results (standard deviation)

#### VI. Discussion - Restatement of results

1. The precision and what that implies about the overall validity of the results.
2. Systematic errors (physical and chemical) that can affect the experiment.
3. How various errors were introduced.
4. What can be done to minimize the error?

#### VII. References - Remember to include all citations in the report.

- Laboratory Reports are **due one week after the lab** has been completed. A typical report is about 3-5 pages long, plus any figures.
- Lab Reports for experiments #1 and #2 are expected to be turned in for grading before midterm.

- The teaching assistants are not responsible for finding or correcting arithmetic errors that will affect the grade for the report.
- A lab report that is considered insufficient or incomplete, such as one that is missing one or more of the items listed above, will be returned to the student ungraded. The report must be brought up to minimum standards and returned **within one week**. A ***10-point penalty*** will be applied.
- Lab reports that are not turned in on time will have ***10 points deducted*** for each week or fraction thereof that the report is late.

### **Laboratory Attendance**

Attendance in Laboratory is mandatory for a passing lab grade. Barring an excused absence, you must attend your scheduled lab section throughout the semester until all your labs are completed.

**Because of a limited number of instruments, the instrumental experiments will be scheduled for you to perform on *specific dates*.** Often, these will be scheduled for students to work in pairs. If you miss one of these labs, you may reschedule it only if there is an opening.

You must get permission from a Teaching Assistant, who will need to find an open slot to reschedule the lab for you.

If you fall behind in the lab, you may work on the afternoon that you are not normally scheduled, but only with permission of the TA and only if there is a spot available for you to work. As the lab is fairly crowded, you will probably not be able to work at your "normal" lab bench.

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**Analytical Chemistry – CHE 226 Syllabus – Fall Semester 2015**

- Instructor:** Dr. Doo Young Kim  
**Course:** CHE 226  
**Credits:** 3 credits (Sections 001, 002, and 003)  
**Location:** Chemistry-Physics Rm. 222  
**Lecture:** Tuesday and Thursday 9:30 to 10:20 AM
- Laboratory:** Section 001: Monday 1 to 3:50 pm  
Section 002 Tuesday 1 to 3:50 pm  
Section 003 Wednesday 1 to 3:50 pm
- Office Address:** Chemistry-Physics Rm. 101  
**email:** [dooyoung.kim@uky.edu](mailto:dooyoung.kim@uky.edu)  
**Office Phone:** 859-257-5597  
**Office hours:** Tuesday and Thursday 10:30 am to 11:30 pm. Additional meetings can be scheduled by appointment via email.
- Textbook:** Daniel C. Harris, *Exploring Chemical Analysis*, Fifth Edition, Freeman and Company, New York, NY (ISBN-978-1-4292-7503-3), 2012. Course material will be supplemented by current events and literature.

**Course Description:**

An introduction to the theory and practice of quantitative chemical analysis. Lecture, 2 hours; laboratory, 3 hours.

**Prerequisites:**

General college chemistry II (CHE 107) and general college chemistry lab II (CHE 113) are required.

**Laboratory:**

Laboratories will be held on Monday, Tuesday, and Wednesday from 1:00 to 3:50 pm in CP-208 and CP-236.

**Laboratory Experiments:**

The lab manual of experiments are available on Blackboard.

**Teaching Assistants: Totally 4 TAs** (Tim Little, Namal Wanninayake, Rosemary Easterday, Somin Park)



**Tentative Lecture Coverage:**

Topics	Chapters	Dates
Chemical Measurements	1, 2	9/1, 9/3
Experimental Error	3	9/8, 9/10
Statistical Analysis: Evaluating the Data	4	9/15, 9/17
Calibration Methods	5	9/22, 9/24
Titration	6	9/29, 10/1
<b>1<sup>st</sup> Exam</b>		<b>10/6</b>
Gravimetric and Combustion Analysis	7	10/8, 10/13
Acids, Bases, and Buffers	8, 9	10/15, 10/20
Acid-Base Titration	10	10/22, 10/27
Polyprotic Acids and Bases	11	10/29, 11/3
<b>2<sup>nd</sup> Exam</b>		<b>11/5</b>
Chemical Equilibrium	12	11/10, 11/12
Complexometry	13	11/17, 11/19
Introduction to electrochemistry	14, 15	12/1, 12/3, 12/8
<b>Final Exam</b>		<b>12/14</b>

**Course Grading:**

The final grade will be calculated from the following course assignments:

Two in-class examinations	30%
Comprehensive Final Examination	25%
Laboratory	40%
Class Participation	5%
<b>Total</b>	<b>100%</b>

**Grades** for the course will be assigned on the basis of the scale shown below. Please note that final numerical grades will not be rounded in assigning final letter grades.

A:  $\geq 90\%$    B:  $\geq 80\%$  and  $< 90\%$    C:  $\geq 70\%$  and  $< 80\%$    D:  $\geq 60\%$  and  $< 70\%$    E:  $< 60\%$

**Suggested Homework:**

Suggested homework problems will be assigned after each chapter is completed. Homework will not be collected and graded, but the similar questions will appear in the exams.

**Tentative Examination Schedule:**

**Exam 1** – Oct. 6<sup>th</sup> (Tuesday)

**Exam 2** – Nov. 5<sup>th</sup> (Thursday)

**Final Exam** – Dec. 14<sup>th</sup> (Monday) at 10:30 am.

**Exam Policy:** The final exam will be accumulative. If an exam is missed and is not excused, a zero will be given.

**Mid-term Grade:**

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>). This grade is only for self-evaluation.

**E-mail Communication:**

We will communicate by email. Dr. Kim will send you important information, files, reminders, etc., during the course of the semester. You should check your UK e-mail daily. The subject of the emails will always include the course name "CHE 226". This will help you filter your email into a separate mailbox. In turn, you must include CHE 226 in the Subject header of all email you send to the instructor and teaching assistants. Please include your full name, student number, and your section as well.

**Attendance Policy:**

There is virtually no way to pass this course without attending the majority of the lectures. Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed per university policy. Class participation grades are obtained by checking attendances occasionally or based on occasional quizzes presented during class.

**Excused Absences for Exams:**

If for any reason you are unable to be present in a regular exam, you need to contact Dr. Kim as soon as possible. If the absence to the regular examination was not planned, you must contact Dr. Kim within one week and supply evidence of an excusable absence. Until you are excused of your absence a grade of zero will be assigned for that assignment or exam. Excusable absences can be found in the Senate Rules under S.R.5.2.4.2. Please visit "Students Rights and Responsibilities" at <http://www.uky.edu/StudentAffairs/Code>. To be excused from an exam, you must contact your professor with legitimate documentation within a week of the missed exam. No exceptions to this policy will be made.

Per Senate Rule 5.2.4.2, students missing any graded work due to an excused absence are responsible: for informing the instructor about the absence within one week following the period of the absence (except where prior notification is required); and for making up the missed work. You will be given the opportunity to make up the work and/or the exams missed.

Any student who needs an excused absence because of their observance of a major religious holiday must provide this information no later than the last day for adding a class. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

**Calculators:**

Use of a calculator during examinations is permitted as long as they are not shared between students. The latter will be considered as cheating. Programmable calculators must have their memories cleared prior to use in an exam.

**Academic Integrity:**

Per university policy, students shall not plagiarize, cheat, falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

“Dry Labbing” or “Pencil Titrating” are terms that describe the act of making up or falsifying laboratory data. This is clearly a form of academic dishonesty/cheating. In a nutshell, plagiarism is defined as taking the work, the words, or the ideas of others and presenting them as your own without proper scholarly attribution. This could be a proper reference or citation to actual quotation marks around any work taken verbatim that is much longer than a short phrase. Although students will often work in pairs and share data, and talk informally about the experiment and their results, each student must prepare and write his or her own laboratory report completely independently.

You must compose your lab reports in your own words, not simply copy the text directly from the laboratory handout. If you have any questions at all about what may constitute academic dishonesty, “cheating”, or plagiarism in the course, please ask the Instructor and/or the Teaching Assistants BEFORE you proceed.

Part II of *Student Rights and Responsibilities* states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission. You can find Senate Rule Part II of *Student Rights and Responsibilities* online at <http://www.uky.edu/StudentAffairs/Code/part2.html>).

Students may discuss assignments with an instructor or other student, but when the actual work is done, it must be done by the student alone. When a student's report involves research in

outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them.

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

**Accommodations due to disability**

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at [drc@uky.edu](mailto:drc@uky.edu). Their web address is <http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>.

**Copyright:**

All course material is copyrighted (either by the professor or others). Therefore, recording, transcribing and then selling, publishing, or posting any of the lecture material presented in class is strictly prohibited. This applies especially to “professional” note-taking services and companies that publish such material on the internet, in written form, or in any audio or video format.

**Cell Phone and Laptop Policy:**

Pagers, cell phones, and any other form of electronic communication devices must be turned off during class and are strictly prohibited during exams. Laptops and tablets are not permitted unless an exception is made after you discuss your specific situation with the professor in his office.

**Blackboard:**

To access Blackboard, go to <http://myuk.uky.edu>. Your username and password are the same as your UK e-mail address. It is your responsibility to log in and not to miss announcements and exams. Computer problems or ignorance of an exam’s date is no excuse for missing exams.

Once in Blackboard, click on the link for CHE 226 to access lecture notes, course announcements, and laboratory handouts.

**Important Dates:**

- August 26 – Wednesday - First day of classes
- August 1<sup>st</sup>, September 1<sup>st</sup> and 2<sup>nd</sup> : First Laboratory (Submit Cl<sup>-</sup> container).
- September 7 – Monday - Labor Day – Academic Holiday
- September 16 – Wednesday - Last day to drop a course without it appearing on the student’s transcript
- September 23 – Wednesday - Last day to officially withdraw from the University or reduce course load and receive a 50 percent refund
- October 12-23 – Monday - Friday - Midterm Grading window is open.

- November 20 (Friday): Last day the CHE 226 Laboratory will be open. All students must formally check out of the laboratory on or before this date. ALL CHE 226 LABORATORY REPORTS MUST BE SUBMITTED TO YOUR Teaching Assistant BY 5:00 PM.
- November 25-28 – Wednesday through Saturday - Thanksgiving – Academic Holidays
- December 14-18: Final week, **Final Exam of this course:** Dec. 14<sup>th</sup> (Monday) at 10:30 am